

Claim 1 is directed to an induction heating coil for heating a shaft member having multiple steps. The induction heating coil comprises annular conductors 1, 2, 3, separately disposed in the axis direction and having inner diameters which form predetermined gaps with outer peripheries of heating portions of the shaft member. According to claim 1, the length of the annular conductors are set so that the areas of the respective heating portions are approximately equal to each other. While the Examiner contends that the prior art teaches this latter feature, Applicants disagree.

In particular, in paragraph number 3 of the Office Action, the Examiner states as follows:

Seulln et al. shows an induction heating oil and method for heating a shaft member having multiple steps, comprising: annular conductors (3, 5) separately disposed in the axis direction and having inner diameters which form predetermined gaps with outer peripheries of heating portions of the shaft member, wherein the lengths of the annular conductors are set so that the area of the respective heating portions are approximately equal to each other (as shown in the Figure the length and the diameter are the same for both the conductors 3 and 5, therefore, the areas of the heating portions are approximately equal as claimed).

Applicants submit that the Examiner's analysis is incorrect. More specifically, as shown in Figure 1 of Seulln, et al., the Examiner is correct when he states that Seulln, et al. discloses a shaft member having multiple steps. Specifically, the work piece illustrated in the Seulln, et al. figure includes a large diameter portion and a smaller or neck portion 8. The inductors 3 and 6 are moveable in the direction of arrows 11 and 14. However, when the inductors are positioned in the manner shown in the figure, it should be appreciated that the areas of the respective heating portions are actually quite different from one another, and not approximately equal to the other as required by claim 1.

More specifically, the Examiner correctly notes that the length and the diameter of the two inductors 3 and 6 are the same. However, this does not mean that the areas of the respective heating portions of the shaft member are approximately the same. To the contrary, the area of the portion of the shaft member heated by the upper inductor 3 would be substantially smaller than the area of the portion of the shaft member heated by the lower inductor 6. This is because the area is a function of the diameter squared (i.e., $A = L \cdot \pi d^2 / 4$). In order for the areas to be approximately the same, the length of the inductor 3 would have to be greater than the length of the inductor 6, similar to that illustrated in Figure 2 of the subject application. Specifically, in Figure 2 of the subject application, you can see that the length of the inductor 1 is greater than the length of the inductor 2 which is greater than the length of the inductor 3 ($H_1 > H_2 > H_3$).

Based on the foregoing, Applicants submit that the Examiner is incorrect when he concludes that this feature of claim 1 is taught by Seulln, et al. Indeed, it is clear that the area of the neck portion which is heated by inductor 3 is substantially smaller than the area of the work piece heated by the inductor 6. The inductor 6 is heating a much larger area than the inductor 3 which is the problem specifically addressed by the claimed invention.

In view of the foregoing, it is submitted that independent claim 1 patentably distinguishes over the prior art. Indeed, it is clear that Ito fails to compensate for the deficiencies of Seulln, et al.

With respect to claim 4, claim 4 is directed to an induction heating method and includes the same limitation discussed above with regard to claim 1 regarding the length of the annular conductor as being set so that the areas of the respecting heating portions of the shaft member are

RESPONSE UNDER 37 C.F.R. § 1.111
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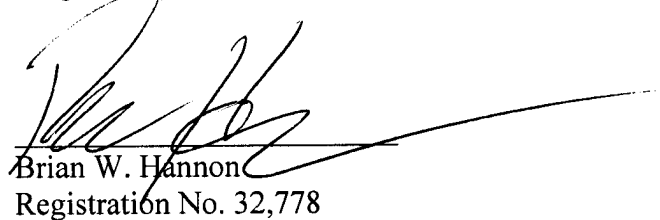
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approximately equal to each other. Thus, it is respectfully submitted that claim 4 is also allowable over the prior art.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

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